

**ELECTROFISHING SURVEY OF  
THE HIGHWOOD RIVER, 1993**

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## EXECUTIVE SUMMARY

The Highwood River originates in the mountains southwest of Calgary, flowing eastward through the mountains, foothills and prairie. The Highwood River and its tributaries provide most of the spawning areas for rainbow trout (*Oncorhynchus mykiss*) in the Bow River downstream of the Bearspaw Dam. The Highwood River itself provides an important regional fishery for mountain whitefish (*Prosopium williamsoni*) and rainbow trout. Bull trout (*Salvelinus confluentus*) and cutthroat trout (*Oncorhynchus clarki*) are the other sport fish present.

This electrofishing survey collected information on species abundance, distribution and size information in the Highwood River between the Davisburg Bridge (Secondary Highway 552) and the Town of Longview.

This study found that the Highwood River downstream of the Town of Longview contains large numbers of rainbow trout and mountain whitefish; however, their abundance was low in the section of river between the town of High River and Highway 2. Bull trout were present in low numbers in the Highwood River between Longview and the Town of High River, with no bull trout caught downstream of the Town of High River. A few cutthroat trout were present in the area downstream of Longview, but they were very uncommon in the area sampled.

Fisheries Management Objectives (FMOs) have been established for the Highwood River and an Instream Flow Needs (IFN) study for fish has been completed. Due to concerns expressed about the appropriateness of using some of the species and life-stages in some reaches of the IFN study, the current study reviews its findings in relation to the FMOs and the IFN study.

The results of this study indicate that the Highwood River IFN study was correct in including juvenile and adult lifestages for both rainbow trout and mountain whitefish in analysis for all five IFN reaches. However, bull trout juvenile and adult lifestages could have been considered in the IFN analysis for reaches 1 and 2.

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## 1.0 INTRODUCTION

The Highwood River originates in the mountains southwest of Calgary, flowing eastward through the mountains, foothills and prairie. It flows into the Bow River 10 km downstream of Calgary. The Highwood River and its tributaries provide most of the spawning areas for rainbow trout (*Oncorhynchus mykiss*) in the Bow River downstream of the Bearspaw Dam (McDonald 1975; Wiebe 1979). This section of the Bow River is one of the best fisheries in the province and considered by many anglers to be a world-class fishery. The Highwood River itself provides an important regional fishery for mountain whitefish (*Prosopium williamsoni*) and rainbow trout. Bull trout (*Salvelinus confluentus*) and cutthroat trout (*Oncorhynchus clarki*) are the other sport fish present.

This electrofishing survey collected information on species abundance, distribution and size information in the Highwood River between the Davisburg Bridge (Secondary Highway 552) and the Town of Longview. The information and experience gained from this survey was used in the development of a three-year study of the trout populations in the Highwood River and its tributaries.

An Instream Flow Needs (IFN) study for fish in the Highwood River has been completed (Locke 1989). Due to concerns expressed about the appropriateness of using some of the species and life-stages in some reaches of the IFN study, this report summarizes the sampling data collected both by the sampling locations (kilometres) used by this survey and by the IFN reaches used by Locke (1994).

## 2.0 METHODS

The Highwood River kilometre-sampling locations were determined by measuring 1.0 km stream segments on 1:50,000 NTS mapsheets using a mapwheel. The starting location for numbering the stream segments was the confluence with the Bow River, which was numbered km 0.0. Every second kilometre between kilometre 12 and 28, kilometre 34 and 56, and kilometre 64 and 78 were sampled by boat electrofishing during August and September, 1993. No sampling was conducted between kilometre 0.0 and 12, kilometre 29 and 34, and kilometre 57 and 64.

The electrofishing configuration used was a 4.5 metre flat-bottom boat equipped with an "egg beater" style throwing anode, a Coffelt electrofisher (model VVP-15) and a 8000 watt generator. Continuous (smooth) DC current with an output amperage of 8 to 10 amps at approximately 300 volts was used to capture the fish.

Captured bull trout, rainbow trout, cutthroat trout and mountain whitefish (maximum of 10 mountain whitefish per kilometre) were anaesthetised using MS222, and were measured for fork length (FL) to the nearest millimetre and weighed to the nearest gram.

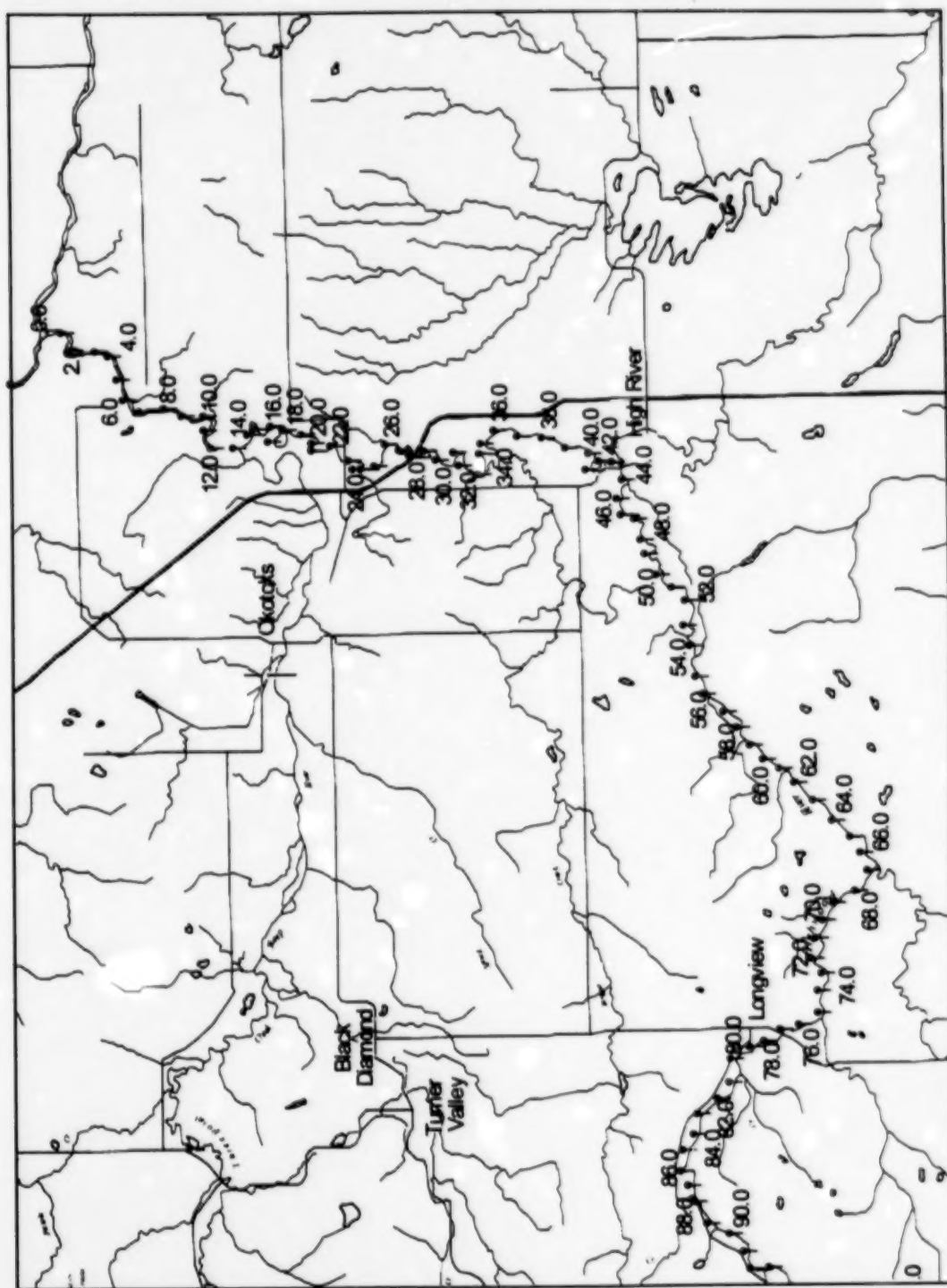


Figure 1. Sampling locations on the Highwood River, 1993.

### 3.0 RESULTS

#### 3.1 Electrofishing Survey

Mountain whitefish were the most numerous sport fish ( $n > 1626$ ) captured or observed in the Highwood River during the survey and made up at least 78% of the sport fish population (Table 1). The most abundant trout species was rainbow trout ( $n = 428$ ), followed by bull trout ( $n = 15$ ) and cutthroat trout ( $n = 4$ ). Sport fish were only absent in one of the kilometres sampled (km 34) (Table 1).

##### 3.1.1 Rainbow Trout

Rainbow trout were caught in 26 of the 29 kilometres sampled (Table 1). They were most abundant in km 48 ( $n = 56$ ), km 16 ( $n = 44$ ) and km 52 ( $n = 40$ ). The only sites where no rainbow trout were caught were km 34, km 36 and km 38.

The mean fork length of the rainbow trout sampled was 172.9 mm with a range from 95 to 380 mm (Table 2). The peak of the fork length distribution for rainbow trout was from 150 to 170 mm, with very few fish caught either below 100 mm or above 250 mm (Figure 2). All kilometres sampled containing rainbow trout had fish between 100 and 200 mm FL (Figure 3). With the exception of km 22, all of the fish larger than 250 mm FL were caught at km 42 or upstream (Figure 3). Mean fork length in most sampling kilometres was between 150 and 200 mm, and there did not appear to be a trend between mean FL and the kilometre sampled (Figure 3).

Table 1. Number of fish caught or observed while electrofishing in the Highwood River, August and September, 1993.

Km	Number of fish caught			
	Rainbow trout	Bull trout	Cutthroat trout	Mountain whitefish
12	12	0	0	50
14	21	0	0	82
16	44	0	0	53
18	23	0	0	25
20	12	0	0	33
22	21	0	0	24
24	10	0	0	55
26	4	0	0	23
28	5	0	0	17
34	0	0	0	0
36	0	0	0	6
38	0	0	0	18
40	6	0	0	50
42	18	0	0	>100
44	22	0	1	>100
46	7	2	0	24
48	56	3	0	>100
50	12	2	0	>100
52	40	2	0	>100
54	8	1	0	82
56	22	1	1	>100
64	14	1	0	69
66	14	0	0	10
68	7	0	0	95
70	7	0	1	>100
72	17	1	0	72
74	5	0	0	38
76	7	0	1	48
78	14	2	0	52
Grand Total	428	15	4	>1626

Table 2. Summary of length and weight data for sport fish caught in the Highwood River, August and September, 1993.

Species	n	Fork length (mm)			Weight (g)		
		Mean	S.D.	Range	Mean	S.D.	Range
Rainbow trout	428	172.9	42.3	95-380	71.2	64.9	5-600
Bull trout	15	301.9	85.2	164-490	372.7	344.2	45-1340
Cutthroat trout	4	254.0	31.7	221-293	205.0	83.2	115-310
Mountain whitefish	256	246.0	98.5	76-457	307.9	327.9	5-1395

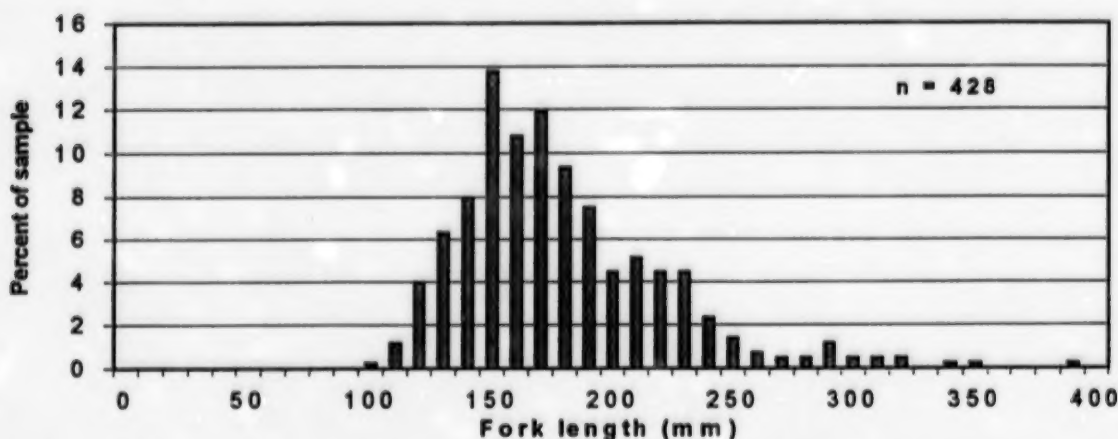


Figure 2. Length frequency distribution of rainbow trout caught by electrofishing in the Highwood River, August and September, 1993.

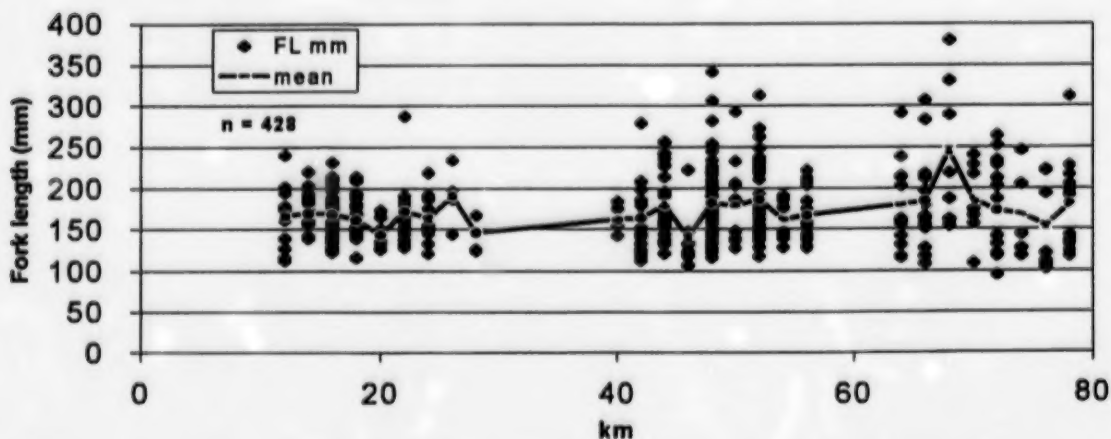


Figure 3. Fork length distribution of rainbow trout caught by electrofishing in the Highwood River according to kilometre, August and September, 1993.



### 3.1.2 Cutthroat Trout

Four cutthroat trout were caught in four of the 29 kilometres sampled during the study (Table 1). The cutthroat trout were all caught upstream of km 44.

The cutthroat trout sampled had a mean fork length of 254.0 mm, with a range of 221 to 293 mm (Table 2).

### 3.1.3 Bull Trout

Bull trout were caught in nine of the 29 kilometres sampled (Table 1). They were most abundant in km 48 ( $n=3$ ) followed by km 46, 50, 52, and 78 ( $n=2$ ). No bull trout were caught below km 46. Bull trout were caught in seven consecutive sections sampled between km 46 and km 64.

The bull trout sampled had a mean fork length of 301.9 mm, with a range from 164 to 490 mm (Table 2). Most bull trout were in the 270 to 290 mm FL range (Figure 4).

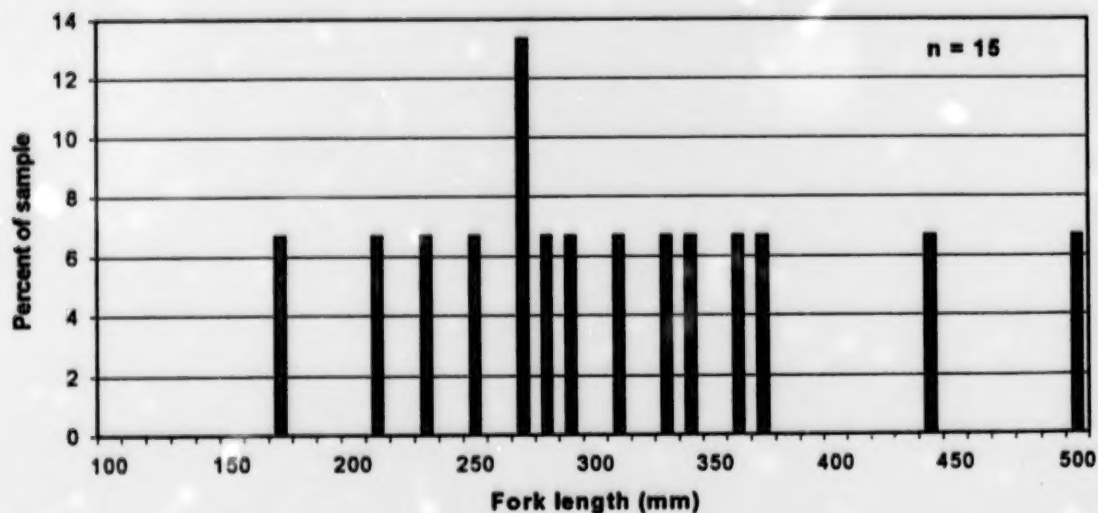


Figure 4. Fork length distribution of bull trout caught by electrofishing in the Highwood River, August and September, 1993.

### 3.1.4 Mountain Whitefish

Mountain whitefish were caught in 28 of the 29 kilometres sampled (Table 1). In seven of the kilometres (km 42, 44, 48, 50, 52, 56 and 70) sampled, there were more than 100 mountain whitefish present (Table 1). From km 42 upstream, mountain whitefish abundance was high in most of the sampling sections (Figure 5). Downstream of km 42, mountain whitefish numbers decreased and were low in relative terms from km 26 to 38, and their numbers increased to a moderate level in the remaining kilometres (Figure 5).

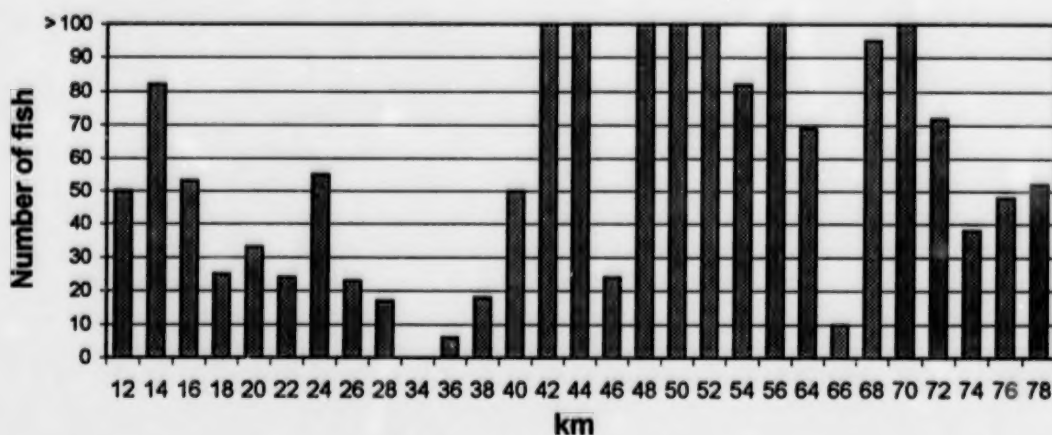


Figure 5. Number of mountain whitefish caught by electrofishing in the Highwood River according to kilometre sampled, August and September, 1993.

The mean fork length of the mountain whitefish sampled was 246.0 mm, with a range from 76 to 457 mm (Table 2). The length frequency distribution showed a wide range of fish sizes present, with a large peak in the distribution from 140 to 160 mm FL (Figure 6).

Most kilometres sampled contained mountain whitefish between 100 and 400 mm FL (Figure 7). Also, most of the mountain whitefish less than 100 mm FL were caught in km 26 or below (Figure 7). Large (>250 mm FL) mountain whitefish dominated most sections above km



40 (Figure 7). The mean fork length of the mountain whitefish sampled from km 12 to 28 tended to be at less than from km 40 to 78 (Figure 7).

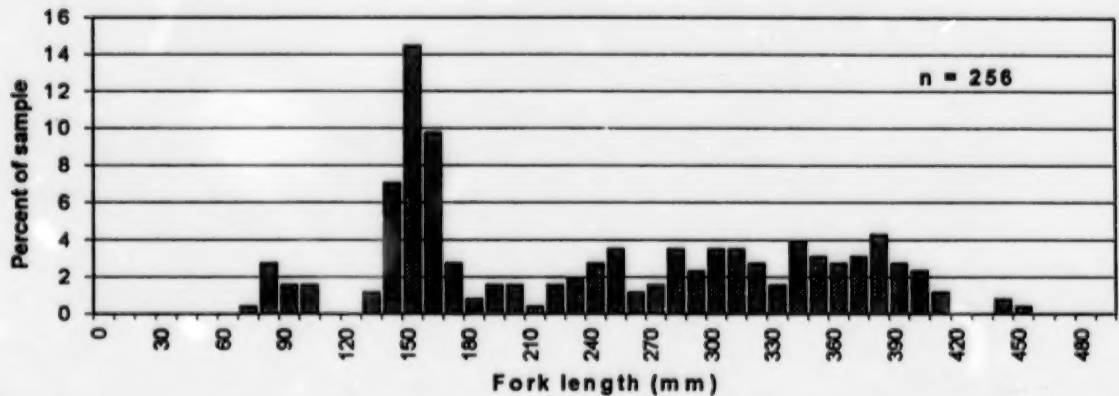


Figure 6. Length frequency distribution of mountain whitefish caught by electrofishing in the Highwood River, August and September, 1993.

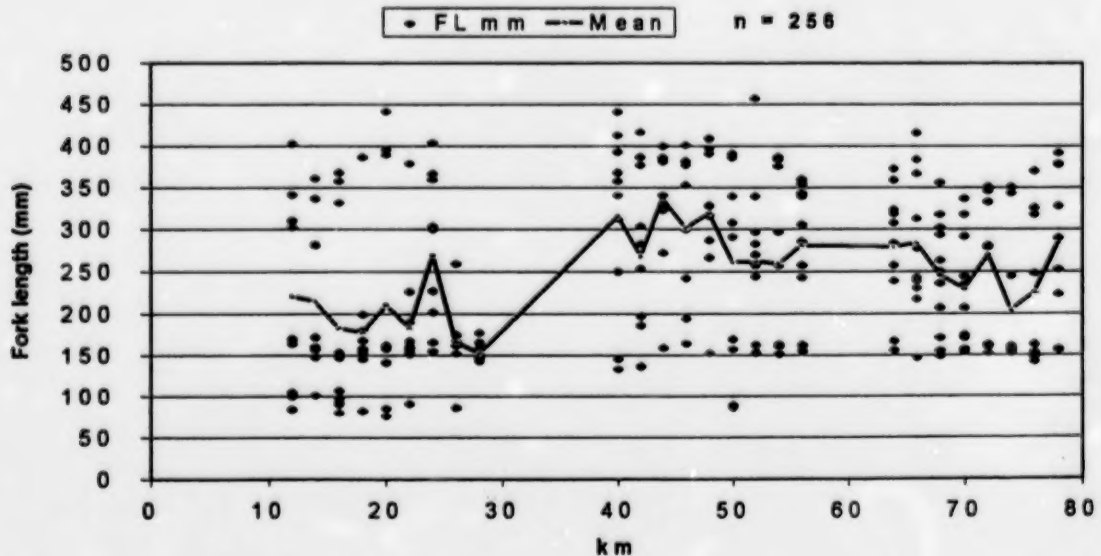


Figure 7. Fork length distribution of mountain whitefish caught by electrofishing according to kilometre, August and September, 1993.

### 3.2 IFN Study Reaches

#### 3.2.1 Rainbow Trout

Rainbow trout abundance was highest in reaches 2 (23.3 fish/km) and 4 (21.8 fish/km) and lowest in Reach 3 (2.5 fish/km) (Table 3).

Table 3. Number of fish caught by electrofishing in the Highwood River according to IFN Reach, August and September, 1993.

IFN Reach Number (km locations)	Number of km sampled	Number of fish (fish/km)			
		Rainbow trout	Cutthroat trout	Bull trout	Mountain whitefish <sup>a</sup>
above Pekisko Creek (68-78)	6	9.5 (57)	0.3 (2)	0.5 (3)	67.5 (409)
1 (55-67)	3	16.7 (50)	0.3 (1)	0.7 (2)	>59.7 (>179)
2 (41-54)	7	23.3 (163)	0.1 (1)	1.4 (10)	>96.6 (>606)
3 (26-40)	6	2.5 (15)	0	0	19.0 (114)
4 (13-25)	6	21.8 (131)	0	0	45.3 (272)
5 (0-12)	1	12.0 (12)	0	0	50.0 (50)
Total	29	14.8 (428)	0.1 (4)	0.5 (15)	>56.1 (>1626)

<sup>a</sup> Due to the large numbers of mountain whitefish encountered in some kilometres, they were counted and recorded as >100.

The mean fork length of the rainbow trout sampled in reaches 1 and 2 (174.7 and 176.4 mm) were somewhat higher than in reaches 3, 4 and 5 (165.4, 164.9 and 165.8 mm) (Table 4). The mean length of the rainbow trout sampled upstream of the IFN study area was larger than in the IFN study reaches (Table 4). All of the reaches had a range of fish sizes present, with reaches 1 and 2 having a more larger (>250 mm FL) individuals than reaches 3, 4 and 5 (Figure 8).

Table 4. Summary of rainbow trout length and weight data according to IFN reach for the Highwood River, August and September, 1993.

IFN Reach	n	Fork length (mm)			Weight (g)		
		Mean	S.D.	Range	Mean	S.D.	Range
0	57	182.0	61.3	95-380	95.0	101.5	5-600
1	50	174.7	44.3	108-307	75.8	63.8	15-300
2	169	176.4	43.2	107-341	74.9	66.9	10-450
3	9	165.4	35.7	124-234	60.6	39.6	15-145
4	131	164.9	28.1	116-287	56.0	36.2	20-275
5	12	165.8	37.6	112-240	60.0	38.6	10-140
Combined	428	172.9	42.3	95-380	71.2	64.9	5-600

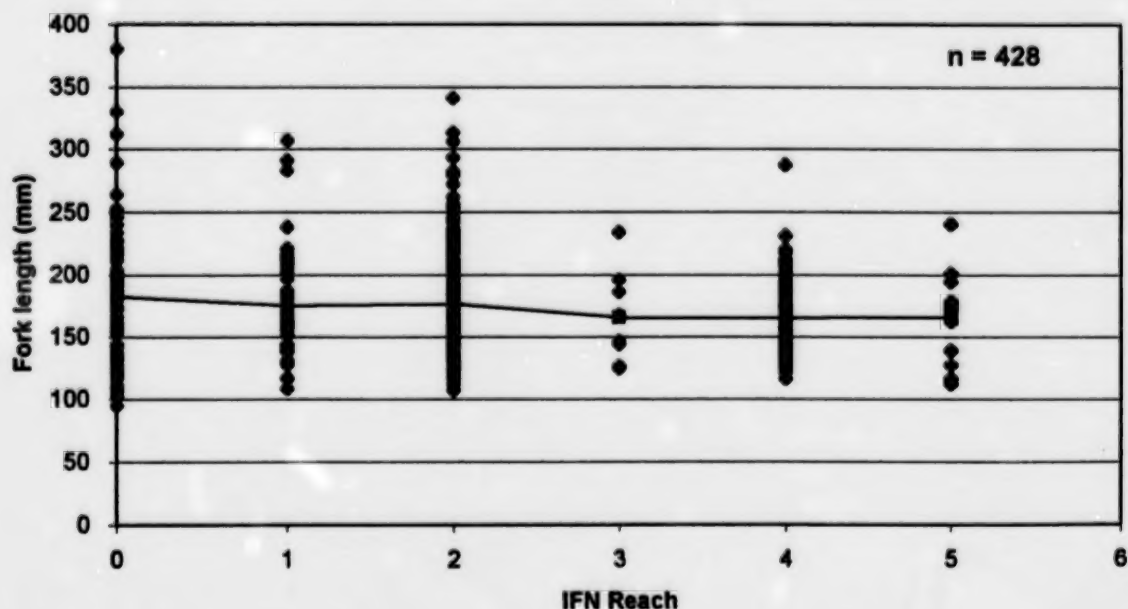


Figure 8. Length frequency distribution of rainbow trout caught by electrofishing in the Highwood River according to IFN Reach, August and September, 1993. (in this graph IFN Reach 0 is the Highwood River above Pekisko Creek.)

### 3.2.2 Cutthroat Trout

Only one cutthroat trout was caught in each of the two uppermost IFN reaches (1 and 2) (Table 3).

### 3.2.3 Bull Trout

Bull trout were only caught upstream of IFN Reach 3 (Table 3). Bull trout were twice as abundant in Reach 2 (1.4 fish/km) as in Reach 1 (0.7 fish/km). Bull trout were more abundant in reaches 1 and 2 than they were in the kilometres sampled upstream of these reaches (0.5 fish/km).

### 3.2.4 Mountain Whitefish

Mountain whitefish were most abundant in reaches 1 (>96.6 fish/km) and 2 (>59.7 fish/km), and least abundant in Reach 3 (19.0 fish/km) (Table 3).

The mean fork length of the mountain whitefish sampled was highest in reaches 1 (280.9 mm) and 2 (290.0 mm) and lowest in reaches 3 (197.4 mm) and 4 (193.9 mm) (Table 5).

Table 5. Summary of mountain whitefish length data according to IFN reaches for the Highwood River, August and September, 1993.

IFN Reach	n	Fork length (mm)			Weight (g)		
		Mean	S.D.	Range	Mean	S.D.	Range
0	60	242.1	80.9	142-392	257.3	246.1	35-875
1	30	280.9	75.8	147-416	366.5	280.3	35-980
2	78	290.0	97.8	86-457	454.1	366.4	5-1350
3	28	197.4	79.1	86-404	153.6	230.7	5-835
4	51	193.9	100.1	76-442	198.5	332.8	5-1395
5	9	220.2	120.1	84-403	283.3	361.9	5-1020
Combined	256	246.0	98.5	76-457	307.9	327.9	5-1395

## 4.0 DISCUSSION

### 4.1 Electrofishing Survey

#### 4.1.1 Rainbow Trout

There was a lot of variability in rainbow trout abundance in the individual sampling kilometres. Rainbow trout abundance was highest in the Highwood River between Pekisko Creek (km 67) and the Town of High River (km 42), and between Highway 2 (km 28) and the Davisburg Bridge (km 6) (Figure 1). Rainbow trout were absent or caught in low numbers downstream from the Town of High River to Highway 2; this section of river has a low gradient, few riffles and contains a large amount of fines in the sediment compared to the river both upstream and downstream of this section.

The Highwood River and its tributaries are the main spawning area for the large rainbow trout population in the Bow River (McDonald 1975; Wiebe 1979). The length frequency distribution of rainbow trout has a sharp peak of small fish from 150 to 170 mm and very few fish larger than 250 mm, suggesting that few large Bow River spawners remain in the Highwood River during the summer or that the mortality of large fish from anglers is high. Larger rainbow trout (>250 mm FL) were captured more frequently upstream of High River (km 42-44) than downstream (Figure 3), suggesting that the river upstream of High River has better habitat for large fish or it is less accessible to anglers.

#### 4.1.2 Cutthroat Trout

Cutthroat trout were very uncommon during this survey, accounting for less than one percent of the trout caught (Table 1). The four cutthroat trout caught were all captured between Longview and High River (Table 1), suggesting that High River is the downstream distribution limit for them.

#### 4.1.3 Bull Trout

Bull trout numbers were low in comparison to rainbow trout and mountain whitefish, but were captured in most of the sampling kilometres between Longview (km 78) and High River (km 44) (Table 1). No bull trout caught were captured downstream of High River during this study (Table 1), suggesting that High River is the downstream distribution limit for them.

The broad range of size classes caught in a sample of only 15 fish (Figure 4) suggests that the habitat between Longview and High River is suitable for all life-stages of bull trout with the exception of young-of-the-year (Table 2). No bull trout less than 164 mm FL were caught (Table 2).

#### 4.1.4 Mountain Whitefish

Since mountain whitefish comprised at least 78% of the sport fish captured or observed (Table 1), they were clearly the most abundant species throughout the portion of the Highwood River sampled. Mountain whitefish also had the most widespread distribution, being absent in only one of the kilometres sampled. Their abundance was highest between Longview (km 78) and High River (km 42) and then between Highway 2 (km 28) and the Davisburg Bridge (km 6) (Figure 1 and Table 1). They were absent or caught in low numbers downstream from High River to Highway 2. This section of river has low gradient, few riffles and a large amount of fines in the sediment compared to the river both upstream and downstream of this section.

The length frequency distribution (Figure 6) showed that a wide range of sizes and life stages were present in the portion of the Highwood River sampled. However, many of the fish were between 140 and 160 mm FL, indicating either a large year-class or heavy exploitation of the larger fish.



## **4.2 IFN Study Reaches**

### **4.2.1 Rainbow Trout**

Rainbow trout were found in all of the IFN reaches; however, their abundance was low in Reach 3, moderate in reaches 1 and 5, and high in reaches 2 and 4 (Table 3). All of the reaches had a range of fish sizes present, with reaches 1 and 2 having more large (>250 mm) individuals than reaches 3, 4 and 5 (Figure 8). The wide range of sizes present indicates that the Highwood River Fisheries Management Objectives (FMOs) stated by Lowe (June 22, 1990 memo; Appendix I) were valid and Locke (1994) was correct in including juvenile and adult lifestages for all five IFN reaches.

### **4.2.2 Cutthroat Trout**

Since only two cutthroat trout were found within the IFN Study Area, in the uppermost reaches they were justifiably excluded from the FMOs and the IFN study.

### **4.2.3 Bull Trout**

Low numbers of bull trout were caught in reaches 1 and 2, and none were caught in reaches 3, 4 and 5. Bull trout were not included in the IFN study, but the data collected suggests that bull trout juvenile and adult lifestages could be considered for reaches 1 and 2 and the FMOs should be changed to reflect this.

### **4.2.4 Mountain Whitefish**

The high numbers of mountain whitefish in all reaches and the presence of a wide range of sizes indicates that the Fisheries Management Objectives for the Highwood River (Appendix I) were valid and Locke (1994) was correct in including juvenile and adult lifestages for all five IFN reaches.

## 5.0 SUMMARY

The Highwood River downstream of the Town of Longview contains large numbers of rainbow trout and mountain whitefish; however, their abundance was low in the section of river between the town of High River and Highway 2. Bull trout are present in low numbers in the Highwood River between Longview and the Town of High River, with the downstream limit of bull trout distribution appearing to be the Town of High River. A few cutthroat trout were present in the area downstream of Longview, but they were very uncommon in the area sampled.

This study indicates that the Highwood River Fisheries Management Objectives (Appendix I) were valid and Locke (1994) was correct in including juvenile and adult lifestages for both rainbow trout and mountain whitefish in analysis for all five IFN reaches. However, bull trout juvenile and adult lifestages could have been considered in the IFN analysis for reaches 1 and 2 and the FMOs should be changed to reflect this.



## **LITERATURE CITED**

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- McDonald, D.G. 1975. Rainbow trout and Canada goose reproduction relative to existing and predicted post-impoundment conditions in the Bow River Basin, Alberta. M.Sc. Thesis. University of Calgary, Calgary, Alberta. 255p.
- Wiebe, A.P. 1979. Kananaskis Country spring spawning survey. Alberta Energy and Natural Resources, Fish and Wildlife Division. 25p.



## MEMORANDUM

## FORESTRY, LANDS AND WILDLIFE

FROM D. Lowe, Head,  
Fisheries Management  
Central Region

OUR FILE REFERENCE

YOUR FILE REFERENCE

TO Allan Locke  
Habitat Biologist  
Habitat Branch  
Edmonton

DATE June 22, 1990

TELEPHONE 151-5142

SUBJECT HIGHWOOD RIVER - FISHERIES MANAGEMENT OBJECTIVES

The Highwood River has important fisheries resources. It provides (1) recruitment of rainbow trout to the Bow River and it has a (2) resident trout and mountain whitefish population.

- (1) The Bow River is an internationally renown trout fishery. It is a high quality recreational fishery for trophy sized rainbow and brown trout. These stocks of fish are maintained through natural reproduction. The main stem Bow River does not provide suitable habitat for the early life history stages for rainbow trout. The spawning and early rearing is accomplished in tributary streams. The relationship between the Bow River and the headwater tributaries is complex and critical to the maintenance of the fish populations.

The Highwood River and its tributaries is the most important system for the Bow River fishery. Its habitat and fish production are an integral part of the recruitment strategy for the Bow River.

The first Fisheries Management Objective for the Highwood River is to maintain (or increase) quality and quantity habitat for spawning and rearing of rainbow trout and to guarantee access to the habitat.

The Highwood River provides migration capabilities to some of its head water tributaries where spawning, hatching and emergence of rainbow trout fry occurs. These fry redistribute throughout the Highwood System where they feed and grow. This system also provides habitat for overwintering prior to being recruited to the Bow River fishery. It can not be emphasized enough that this system is critical to the Bow River Management program.

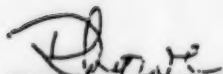
- (2) The Highwood River also provides habitat for a resident population of rainbow trout and rocky mountain whitefish. These two species live year round in the system. They spawn hatch and feed in the river. These fish provide an important recreational fishery.

cont'd./2

The second Fisheries Management Objective is to maintain (or increase) quality and quantity of habitat for year round production of all life history stages of rainbow trout and rocky mountain whitefish.

The recreational fishery on the Highwood River system is used extensively by local anglers and is an important destination area for Calgary fishermen.

The Highwood-Bow River System is complex. However, over the past two decades many studies have documented its importance to fish. The data collected over the past years has been summarized in a report "An Overview of the Bow River Fishery in the Calgary Region" (Fernet 1990).



Doug Lowe, Head  
Fisheries Management

DL/mc

cc: Ken Zelt  
E. Vuori